140-TYPE AMPLIFIER
TESTS, ADJUSTMENTS AND REQUIREMENTS

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1. GENERAL

1.01 This section describes the tests, adjustments, and requirements associated with 140-type amplifier. It includes routine maintenance and trouble investigation tests. Included also are schematic circuit diagrams indicating various voltage and current measurements, and wiring diagrams.

1.02 This section covers the 140A Amplifier and the 1140A Amplifier which are described in Section 024-105-100. The 1140A Amplifier consists of a 140A Amplifier mounted in a KS-13678 metal cabinet. This section is reissued to simplify testing procedures. Since a general revision has been made, arrows ordinarily used to indicate changes have been omitted.

1.03 Section 024-105-300 lists the initial and routine tests, as well as information on the frequency of routine maintenance tests, on 140-type amplifiers.

1.04 A list of parts for the 140A and 1140A Amplifiers is included in Section 024-105-100.

1.05 *Test Equipment:* The tests throughout this section require the use of the following test equipment:

1 — KS-14510 Volt-Ohm-Milliammeter or Weston 779A Analyzer
1 — KS-15560 Tube Tester or equivalent
1 — 19C Oscillator or equivalent
1 — 13A, 21A or 30A Transmission Measuring Set
1 — 5A Attenuator or equivalent
1 — Output Pad as described in Paragraph 2.09
1 — 106A 600-Ohm Resistor
3 — W3U Shielded Cords or equivalent for making test connections

2. TESTS AND ADJUSTMENTS

Primary Power Voltage Measurement

2.01 The purpose of this test is to determine whether or not the primary line voltage is within the operating range of the amplifier.

2.02 Apparatus:

KS-14510 Volt-Ohm-Milliammeter

2.03 Procedure:

(1) Adjust the voltmeter to read voltages of over 100 volts, ac or dc, as appropriate.

(2) Measure the supply voltage at the fuse box or other convenient point between the fuse box and the amplifier.

Requirement: The ac line voltage must be not less than 105 and not more than 125 volts rms. If direct current is supplied to the amplifier the line voltage must be not less than 105 and not more than 125 volts; polarity must be correct (see schematic drawing).

Caution: In making these measurements care should be taken to avoid contact with line terminals.

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Electron Tube Tests

2.04 These tests will check the tubes for correct operation in the amplifier.

2.05 Apparatus:

1 — KS-15560-L1 or L2 Tube Tester

2.06 Procedure:

(1) Test each tube in accordance with the information given in Section 100-635-101.

(2) Discard any tubes which fail to meet the requirements.

Caution: When the amplifier is operating, the tubes will be too hot to handle safely. Use gloves or tube puller when removing a tube.

Gain and Gain-Frequency Tests

2.07 Gain tests on the 140-type amplifier require care due to the amount of gain that may be encountered and also to the fact that this type of amplifier is capable of greater power output than those usually encountered in the telephone plant. The use of shielded connecting cords is specified. This should aid materially in avoiding errors due to stray coupling between input and output circuits when measuring gain. In all cases an attenuator should be employed between the source of testing power and the amplifier. A pad between the output of the amplifier and the transmission measuring set is also specified in order that the power handling capacity of the latter will not be exceeded.

2.08 The output level of the oscillator should be 1 milliwatt at the test frequencies 50, 1000, 5000 and 10,000 cycles. The oscillator and transmission measuring set should be connected together, and the oscillator adjusted until a reading of 0 dbm is obtained on the measuring set. The oscillator and measuring set should then be reconnected to provide the arrangement for each test to be described.

2.09 Amplifier gain is measured between 600-ohm impedances with the amplifier furnishing about 1 watt of power (+ 30 dbm). Fig. 1 shows a suggested arrangement of the output pad referred to in Paragraph 2.07. R1 is a 562-ohm resistor and must dissipate approximately 1 watt of power. R2 is a 38-ohm ½ or 1-watt resistor. If available, an 18A (37-ohm) resistor and an 18BD or 18HF (580-ohm) resistor may be used. The nominal loss of this pad is 24.5 db; the actual value will depend upon the accuracy of the resistors used. The actual pad loss should be determined by test since it must be known for the computations of the amplifier gain.

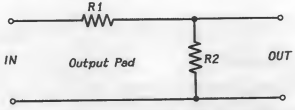


Fig. 1 — Suggested Output Pad Arrangement

2.10 The following equipment is required for making these tests:

1 — 19C Oscillator or equivalent
1 — 5A Attenuator or equivalent
1 — Output Pad as described in Paragraph 2.09
1 — 13A, 21A or 30A Transmission Measuring Set
3 — W8U Shielded Cords or equivalent for setting up the testing arrangements

2.11 Set up the testing arrangements indicated in Fig. 2. The 5A Attenuator should be adjusted for 30 db or more loss. The amplifier gain control should be turned fully clockwise. The gain of the amplifier is indicated by the algebraic sum of the attenuator loss, output pad loss and the dial and meter readings on the measuring set.

Requirement: The 1000-cycle gain (G_a) should be 60 db ± 1.5 db. The gain at 50, 5,000 and 10,000 cycles should be within the limits of G_a +0.5 db and G_a −2.5 db.

2.12 Make a 1000-cycle attenuation test by observing that the gain gradually reduces from maximum to zero as the gain control is turned slowly from maximum to off.

Noise Tests

2.13 This test is made to determine that the ratio of maximum single-frequency signal to steady noise is within the limit established for the 140-type amplifier.

2.14 Apparatus:

1 — 13A, 21A or 30A Transmission Measuring Set
1 — 106A 600-Ohm Resistor

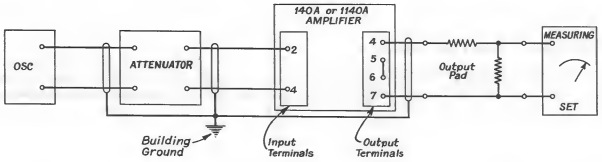


Fig. 2 — 140A Amplifier — Gain and Gain-Frequency Testing Arrangement

2.15 Procedure:

(1) Set up the testing arrangement shown in Fig. 3.

(2) Set the gain control to maximum.

Requirement: The unweighted noise output should not exceed −15 dbm.

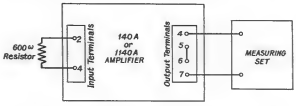


Fig. 3 — Noise Measuring Arrangement

Preliminary Trouble Locating Tests

2.16 When the amplifier is in trouble and the cause is not due to burned out or otherwise defective tubes, the amplifier should be checked (with the power cord plug removed from the supply receptacle) for loose connections or broken wires. Fig. 4 shows a wiring diagram of the 140A Amplifier, and Fig. 5 shows a schematic diagram of the 140A Amplifier.

Caution: Avoid personal contact with terminals, especially those on electrolytic capacitors. The charge on some of these will be over 200 volts.

Operating Voltage Measurements

2.17 If the tests mentioned above fail to reveal the trouble, it will be necessary to check the operating voltages in the amplifier. Fig. 5 shows these voltages in the amplifier. The values shown are typical of those which may be expected when employing a voltmeter with a resistance of at least 20,000 ohms per volt, and a line voltage of 120 volts, ac or dc.

2.18 The values of voltages on the various elements of the electron tubes may be measured at the tube sockets on the underside of the chassis. The terminal on the socket to which each element of the electron tube is connected is indicated by terminal number on the schematic drawing in Fig. 5. The standard numbering sequence for tube sockets is shown in the wiring diagram in Fig. 4.

2.19 The voltages must be measured between the point indicated and the B negative lead, not to the chassis.

2.20 Apparatus:

KS-14510 Volt-Ohm-Milliammeter or Weston 779A Analyzer.

2.21 Procedure:

(1) Switch on the power supply and wait for several minutes.

(2) Obtain voltage readings, beginning at the output of the power rectifier tube, and working back through the circuit to the elements of the other tubes until an indication of the trouble location is obtained.

Caution: In making these tests, care should be taken to avoid contact with live terminals or with the amplifier chassis. It should be noted that normal operating voltages of over 200 volts may be encountered. In addition, a dangerous potential will usually exist between the amplifier chassis or internal wiring and any external grounded object.

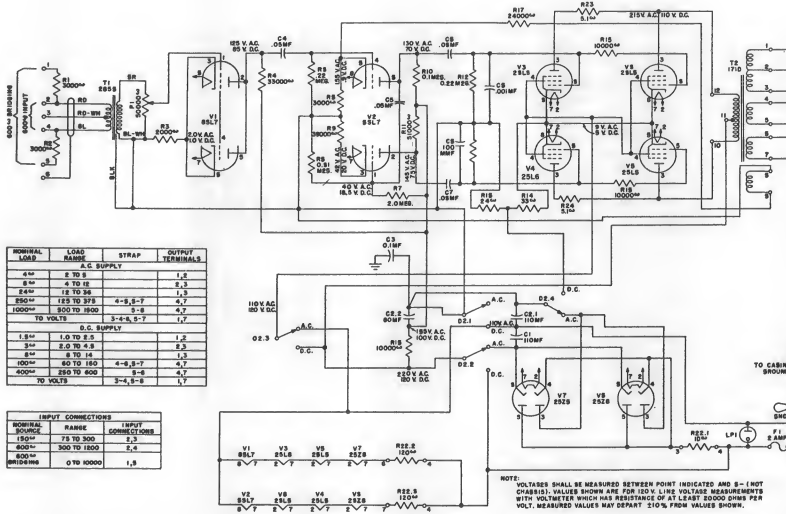
2.22 Typical performance characteristics of this amplifier are shown in Fig. 6.

Electrolytic Capacitor Testing and Replacement

2.23 It may be necessary to attempt to re-form the film in the electrolytic capacitors in a 140-type amplifier if the latter has not been in use for several months. This may be done by following the method described in Section A438.961. This section is not cross-numbered in the "E" series.

2.24 If the hum level of the amplifier is high after an attempt has been made to re-form the capacitor film, the capacitors should be tested as described in Section 032-110-701, and replaced where the need is indicated.

Fig. 4 — Wiring Diagram



NOMINAL LOAD	LOAD RANGE	STRAP	OUTPUT TERMINALS
A.C. SUPPLY			
4Ω	2 TO 5		1,8
8Ω	4 TO 12		2,3
16Ω	12 TO 36		1,3
250Ω	125 TO 375	4-8,5-7	4,7
1000Ω	500 TO 1500	5-8	4,7
70 VOLTS		3-4-8, 5-7	1,7
D.C. SUPPLY			
1.5Ω	1.0 TO 2.5		1,2
3Ω	2.0 TO 4.5		2,3
8Ω	8 TO 14		1,3
100Ω	60 TO 150	4-8,5-7	4,7
400Ω	250 TO 600	5-8	4,7
70 VOLTS		3-4,5-8	1,7

INPUT CONNECTIONS		
NOMINAL SOURCE	RANGE	INPUT CONNECTIONS
150Ω	75 TO 300	2,3
600Ω	300 TO 1200	2,4
600Ω BRIDGING	0 TO 10000	1,5

Fig. 5 — 140A Amplifier Schematic

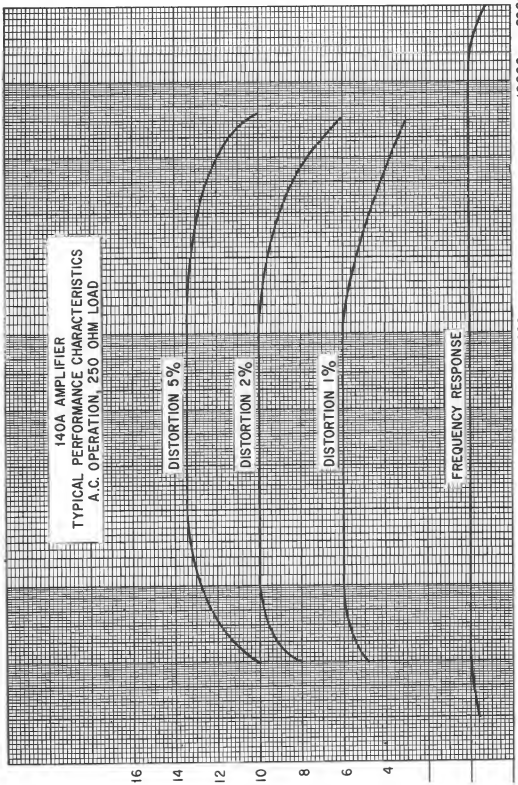


Fig. 6 — Frequency in Cycles Per Second